Vol. VI.—No. 29.] [MAY, 1885.

THE

MINERALOGICAL MAGAZINE

AND

JOURNAL

OF THE

Mineralogical Society.

INSTITUTED 3rd FEBRUARY, 1876.

EDITED BY A COMMITTEE OF COUNCIL.

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THE MINERALOGICAL SOCIETY

Mineralogical Society.

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EXCERPT MINUTES OF COUNCIL MEETING.

Held at the Museum, Jermyn Street, December 9th, 1884.

The Rev. Prof. Bonney, D.Sc., F.R.S., President, in the Chair.

Mr. Frank Johnson, Associate, was elected a Member.

EXCERPT MINUTES OF COUNCIL MEETING.

Held at the Museum, Jermyn Street, March 10th, 1885.

The Rev. Prof. Bonney, D.Sc., President, in the Chair.

Messrs. Jas. Currie, and Alfred Harker, B.A., and Monsieur Alfred Lacroix, were elected Members.

The audited Balance Sheet for 1884 was submitted and ordered to be printed and issued (p. x.).

Mineralogical Society—Abstract of Receipts and Payments from 1st January to 31st December, 1884.

RECEIPTS.

	£	s.	d.
Balance from year 1883	17	0	4
Subscriptions paid in advance	5	4	0
,, for current year	93	1	0
,, Arrears	12	17	0
Entrance Fees and Life Compositions	17	1	0
Sale of Publications	38	10	0
Dividends	5	0	3
	£188	13	7

PAYMENTS.

	£	s.	d.
Printing	122	15	6
Illustrations	19	11	0
Expenses of Meetings	2	13	8
Clerical Expenses	7	7	0
Postages, Parcels, &c.	14	12	8
Investments	19	0	3
Sundry Small Items	2	12	5
Balance	0	1	1
	£188	13	7

Examined and compared with the vouchers and found correct. (Signed)

BENEDICT KITTO,
F. W. RUDLER, } Auditors.

Assets and Liabilities *on 31st December*, 1884.

LIABILITIES.

	£	s.	d.
Williams & Strahan, Printing	13	13	2
Mintern Bros., Plates	3	19	0
Clerical Expenses (1884), including Editing Magazine	16	16	0
Subscriptions paid in advance	5	4	0
Excess of Assets over Liabilities	215	12	4
	£255	4	6

ASSETS.

	£	s.	d.
Subscriptions for 1884 unpaid	20	14	0
,, 1883 ,,	9	9	0
New 3 Per Cents. £179 12s. 10d. at 99⅝	178	10	4
Stock of Publications (average yearly sale)	39	9	10
Simpkins & Co., Sale of Publications	5	13	7
Sale of Publications by Office—unpaid	1	7	9
	£255	4	6

Examined and compared with the vouchers and found correct. (Signed)

ROBERT H. SCOTT,
General Secretary.

GENERAL MEETING.

Held at the Museum, Jermyn Street, December 9th, 1884.

The Rev. Prof. Bonney, D.Sc., F.R.S., President, in the Chair.

The following papers were read :—

J. Ernest Ady, Esq.—"Observations on the Preparation of Mineral and Rock Specimens for the Microscope." (p. 127.)

Professor Heddle, F.R.S.E.—"The Geognosy and Mineralogy of Scotland (Ross and Cromarty)." Part I., The Islands.

Mr. J. H. Collins, F.G.S., exhibited a specimen of tinstone from Irish Creek, Rockbridge County, Virginia, U.S.A., a new locality for that mineral. It consisted of an indistinctly crystallised cleavable mass of light brown colour, pretty much like the cassiterite from the North of Spain. It was, however, remarkable for its greatly inferior hardness, which did not exceed that of felspar on the cleavage planes. It had evidently been broken from a vein.

GENERAL MEETING.

Held at the Museum, Jermyn Street, March 10th, 1885.

The Rev. Prof. Bonney, D.Sc., F.R.S., President, in the Chair.

The following papers were read* :—

Herr Hj. Sjögren.—"On the Physical and Geometrical Properties of Graphite." (Communicated by Dr. Hugo Müller, F.R.S.)

Mr. W. Semmons.—"Some Notes on a recent Discovery of Connellite."

Mr. Fletcher exhibited a portion of a Meteorite consisting of a mass of iron 17½ lbs. weight, which had been found at Yundagin, 90 miles east from York, West Australia, and forwarded by the Rev. C. G. Nicolay to the Society for presentation to the British Museum.

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* These Papers will appear in the next No.

LIST OF DONATIONS

From January 1st to March 31st, 1885.

The American Journal of Science, Vol. XXIX., No. 169. Presented by the Editors.

The American Chemical Journal, Vol. XI., No. 5. Do.

The Naturalist, for Jan., Feb. and March, 1885. Do.

Descriptive Sketch of the Physical Geography and Geology of the Dominion of Canada, by A. R. C. Selwyn and G. M. Dawson, with Geological Map; also Comparative Vocabularies of the Indian Tribes of British Columbia. By W. Fraser Tolmine. Presented by the Geological Survey of Canada.

Fourth Annual Report of the State Mineralogist of California. Presented by the California State Mining Bureau.

Report on the Geology of the Kimberley District, West Australia. By E. T. Hardman. Presented by the Author.

Notes on the Progress of Mineralogy in 1884. By H. Carvill Lewis. Presented by the Author.

Verhandlungen der k.k. geologischen Reichsanstalt, Nos. 1 to 18, 1884; No. 3, 1885; also Jahrbuch der k.k. geolog. Reichsanstalt, Vol. XXXIV., No. 4. Presented by the Geological Institute of Vienna.

Mineralogische und petrographische Mittheilungen. Herausgegeben von G. Tschermak. N.F. Vol. VI., Nos. IV., V., VI. Presented by the Editor.

Ueber die Grenzen der Zechstein-formation und der Dyas überhaupt. Von Geh. Hofrath Prof. Dr. H. B. Geinitz. Presented by the Author.

Annales de la Société Géologique de Belgique. Vol. XI., 1883-4. Presented by the Society.

Atti della Reale Accademia dei Lincei. Transunti; Vol. VIII., fas. 16. Rendiconti, Vol. I., fas. 1 to 6. Presented by the Society.

Il Porfido del Vallone di Roburent del Dottore Guiseppe Piolti; also, Il Calcare del Monte Tabor. By the same Author. Presented by the Author.

Anales de la Sociedad Cientifica Argentina. Tomo XVIII., No. 6. Tomo XIX., Nos. 1 and 2.

THE MINERALOGICAL MAGAZINE

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MINERALOGICAL SOCIETY.

No. 29. MAY 1885. Vol. VI.

ADDRESS TO THE MINERALOGICAL SOCIETY.

By the Rev. Prof. Bonney, D.Sc., LL.D., F.R.S., President.

[Delivered at the Anniversary Meeting, Oct. 21st, 1884.]

It does not appear to be at present a matter of fixed precedent whether the Annual Meeting of the Mineralogical Society should or should not be associated with the delivery of a Presidential Address; and I had hoped, knowing how slight are my claims to the honour which you have conferred upon me, to have escaped until I give place to a worthier successor. But our Honorary Secretary has intimated to me that he would prefer 'a few remarks,' and as I feel so strongly the obligations under which he has placed the Society by the free gift of his valuable time, his will is law to me.

As the report laid before you justly states, the past year has been a marked epoch in the history of this Society, since it has witnessed the fusion with it of the Crystallological Society. For this

most fortunate event (as I deem it) we are greatly indebted, I must be allowed to say, to the tact and zeal of our Honorary Secretary. There were not a few difficulties to be surmounted, some susceptibilities to be consulted, but the task was lighter to one so well known in scientific circles than it would have been to many other men of equal energy and zeal for mineralogy.

I have called the event 'most fortunate,' because the existence of two societies so nearly identical in their ends, in fact only differing by the one being nominally more restricted in its means than the other, has always seemed to me a great misfortune. There may be and there sometimes is a healthful effect produced by rivalry; bnt in science, as in theology, I am afraid that there is always more danger of loss of energy through friction, and even conflict, than hope of gain through a noble emulation. Permanent good, as it seems to me, is only likely to be obtained when of two such societies, the one is content to accept the humbler position, and act to some extent as the helpmate of the other. Certainly we could not expect that this *rôle* would be assumed by a society among whose leading members were the Professors of Mineralogy of Oxford and Cambridge, and the Keeper of the Department of Mineralogy in the British Museum —while we, as far the larger and hardly the less distinguished body, certainly could not be expected to take the 'lower room.'

I think indeed that in all respects I am fortunate in being President at an epoch when the Council are able to present you with such a report as the present; for it also announces that our finances, which two years since were in so critical a condition, have now been restored to a healthful tone; and I trust that by due economy, without any reduction of the real value of our publications, we may be able at the year's end to announce a balance yet more satisfactory.

I find also in the report yet another subject for congratulation, that is, the success which marked the meeting held in Edinburgh last June. There are many advantages attendant on the occasional 'decentralisation' (if I may so apply the term) of a scientific society; and ours, as the number of students of

mineralogy is not large, is exactly one suited for a life mainly settled, but occasionally migratory. I trust, then, that the Scotch meeting will henceforth be an annual occurrence, and I am sure that we may trust to the zeal for fatherland, which in Scotland manifests itself in the nobler instead of the baser form, to make that meeting always a success.

There is one other event of the year to which, although it has no direct connection with our Society, I should like to refer—I mean the rearrangement of the mineralogical collection in the British Museum, which, although it has been the work of more than one year, may be regarded as completed in this by the publication of the Guide to the Mineral Gallery of the British Museum (Natural History). We can now examine that magnificent collection much more easily than in its old home at Bloomsbury. But the feature of the new order of things to which I wish at the present to direct your attention, is the special provision made for the instruction of learners. It is quite true that a willingness to act as public teachers as well as custodians of the national treasures has long been an honourable characteristic of the members of the various departments of the British Museum; and I shall ever remember gratefully the kindnesses which I have received from the late Keeper, Professor Maskelyne, and Mr. T. Davies, in their cramped quarters at Bloomsbury; but the removal of the collection to its more spacious abode at Kensington has given to Mr. L. Fletcher (the present Keeper), with the same able helper, an opportunity which he has been quick to seize, of arranging a number of additional cases, after a distinctly educational plan, and publishing a guide book to the Museum so arranged as to alleviate that overpowering sense of bewilderment with which the beginner (and I may say not only the beginner) contemplates that vast collection. I think, as a teacher myself, I may venture to assure Mr. Fletcher and Mr. Davies of the gratitude of teachers and students alike. The liberality also of the trustees in distributing among places of education their surplus duplicates, many of them specimens of considerable value, though, like silver in the days of Solomon, of little account in that grand collection, calls for a grateful acknowledgment from students.

You will not look to me, gentlemen, for any profound remarks on the subject of Mineralogy. As I vainly urged, when the honour of becoming your President was proposed to me, I am a Petrologist, not a Mineralogist; I pursue mineralogy, if in this place I may dare to make the confession, not so much for its own sake as for the light which it throws upon the constitution and the genesis of rock. I am more concerned with the identification of a mineral, the circumstances of its formation, and its paragenetic habits, than I am with peculiarities either in its form or its chemical composition. Still, from this point of view, a distant one it must be admitted, some things may possibly strike an observer which might not occur to one more profoundly immersed in the study of the subject; and on this account I am about to offer, or perhaps more correctly speaking to reiterate (for they are not new), two criticisms upon systematic mineralogy as it is set forth by many workers. The points to which I am going to refer are to a certain extent questions of nomenclature; but they are more than this—they involve principles, and these of wider application than our science. A word in science should be the expression of a thought, a name more or less the representation of an idea; hence questions of great importance, principles of the highest moment, may often be involved in what at first sight may seem only a matter of nomenclature.

I wish, then, to call your attention to two tendencies among mineralogists, which, as it seems to me, impede the real progress of the science. These are, an over precision, displayed in the notation by a novel name of some slight observed varietal difference in a mineral; and an over laxity in the application of specific names. These tendencies at first sight would appear the outcome of entirely different habits of mind, yet apparently they coexist in the same individual, and possibly find their origin in the same mental idiosyncrasy.

The first—the fondness for giving new names—is only the verbal expression of a habit of species splitting, known in other branches of science, but nowhere I think so rampant as in mineralogy. Open any large work on descriptive mineralogy, and in addition to species you will find its pages studded with named varieties,

some of them quoted only to be rejected by the author, others obviously only distinguished by characteristics which cannot be of real value. To take as an example a single mineral group, the felspars. To begin with, we have a generally admitted difficulty in deciding as to what number of 'major' species (if I may use the term) we shall accept: some authorities even doubting whether *Labradorite* and *oligoclase* can be called 'species,' though I suppose most would agree that they must be in some way designated; many more dispute the claims of *Andesine;* and then we come to forms like *Perthite* and *Bytownite*, obvious mixtures of more than one species, and a crowd of others, such as *Indianite, Huronite, Tschermakite, Hafnefiordite, pericline, loxoclase, Murchisonite, Carnatite, hyposclerite, erythrite,* &c.

I do not deny that in these and similar cases with regard to several other minerals which it would be easy to quote, the names often express some variation either in aspect or mineral composition or look, of which it may be well to take note—as, for example, the peculiar bloom of *peristerite*, or the rather exceptional composition of *Bytownite;* but I object to giving to these a distinctive name instead of a distinctive epithet. This may seem at first sight a trivial criticism—to object to *peristerite*, and prefer such a term as opalescent or chatoyant *albite*, may seem to be choosing the more cumbrous instead of the more concise appellation, but I think there is a question of principle involved: the one nomenclature accentuates the distinction, and loses sight of the relation; the other, while noting the distinction, keeps prominent the relationship. This has an inevitable mental influence; diverse names mean diverse mental pigeon-holes; by giving a thing a separate name we tend to give it a separate entity as a conception. To give a rough example: I am distinguished from my brother by a separate christian name, and identified with him by the same surname; if I changed the latter, the bulk of people—all but the few who knew us intimately—would forget that we were related, and the world at large (assuming for a moment that such insignificant beings could attract notice) would be perplexed at the visible resemblances. He who augments the lists of minerals by naming a dubious

species, depend upon it, confers the reverse of a boon upon his science. If we acted on the same principle in petrology, we should exhaust the Greek lexicon or the parish lists in our search for names. I remember, indeed, some years back an ardent mineralogist, who, straying into petrology, got hold of two or three varieties of felsite, each perfectly common types, and thoroughly well known to petrologists as of wide distribution, and proceeded to confer upon them barbarous names from some outlandish villages in Britain. I have often wondered how many new species he would make out of my collection. But seriously, this tendency to individualistion (not, I fear, without some root in human vanity) tends to promote a mental habit very fatal to real progress in science. It may be described in the homely phrase "not being able to see the wood for the trees." The great end of science is to determine principles and seek after laws. In the search for these distinction is in reality only a step in the process of correlation ; a classification founded only on divergences would be universally admitted to have no philosophical basis. All great generalisations are made by discussing the resemblances which underlie the apparent divergences, tracing (as it were) the many distinct twigs back to the one parent stem ; correlating facts, correlating phenomena, correlating principles, till they can be shown to be the result of general laws, the outcome of the forces or force of which all nature is the result.

The second point to which I desire to draw your attention seems at first sight exactly the opposite to the last mentioned. This is, a laxity in our system of classification, by means of which the mineral 'species or genus,' if I may be allowed the phrase, is made too inclusive; or, to put it more clearly, many substances are called minerals which have no real claim to the name. It is of course difficult to frame in a few words a perfectly unexceptionable definition of a mineral; but it may be described as an inorganic substance, a possible constituent of the earth's crust, distinguished from its fellows by certain definite characteristics of form, structure, and chemical composition. In regard to the first and second of these three characteristics we have to allow of some laxity in order to admit certain minerals of indefinite form,

such as opal; and in the case of the last considerable latitude is sometimes necessary because of isomorphic replacements among the chemical constituents. Still we are able to attach a fairly exact meaning to the definition of a mineral, and the difficulty here is no greater than that which frequently confronts us in the Natural Sciences. For an example, then, of the defect which I mean, I will again refer to the felspars. In some of our best text books of mineralogy I find set down under the head of "an amorphous form of orthoclase" *pitchstone* and *obsidian*, to say nothing of other substances yet more open to objection. Now, what excuse is there for terming these substances *minerals?* They have no definite form, for they are glasses, they are more or less composite in habit, and their variations in chemical composition far exceed the possibilities of isomorphic replacements. Take any table of analyses of these volcanic glasses, and you will see by a simple calculation, I might even say at a glance, that they contain much more silica than could be used up in forming a felspar; so that, if the materials were crystallised you would have a felspar with an admixture (and that a very variable one) of free quartz. Nay, I have even seen crowded together in one list under the head of 'orthoclase,' volcanic glasses which one can see from a mere study of the analyses (apart from any knowledge one may have otherwise acquired) represent mixtures of quartz and orthoclase, or of quartz and albite or oligoclase with a little of a magnesian mineral (hornblende, augite, or biotite), and mixtures of labradorite or anorthite, without any quartz and with a considerable proportion of the above magnesian minerals. I grant that these glasses, with such rocks as felstone, are commonly inserted rather apologetically, but my contention is that the student ought not to be confused by seeing them classed as *minerals* at all. They should be quoted as *rocks*, into the composition of which such and such minerals, visibly or invisibly, enter. In like way coal has no claim to be ranked among minerals; and I think that it would be much better to designate even chalcedony, flint, chert, agate, jasper, &c. as mineral aggregates (*i.e.* rocks), into the composition of which microcrystalline quartz very largely (sometimes exclusively) enters. I need not occupy your time by increasing the list of examples of this confused thinking, though it would not be difficult.

In justification, and to point the moral of these criticisms, I will make one more, speaking now as a petrologist. It is that, as a rule, we find the man of science, who is mainly a mineralogist, less helpful than we should have expected, nay, that sometimes he leads us into darkness rather than light. Perhaps I may be pardoned for giving one or two examples. In petrology the question of genesis is obviously one of the most important; yet mineralogists (I suppress names because I do not wish to attack individuals) have proposed classifications which group together such rocks as eclogite and Lherzolite simply on the ground that they are without felspar; but the former contains a considerable quantity of alumina, and if always an igneous rock (more work is still needed among the massive garnetiferous rocks) is obviously nearer to the diorites; while the latter contains hardly any alumina, and belongs to the peridotites or olivine-rocks, a group as well marked as any other in Nature. By the same author chlorite-schist and serpentine are grouped together—a more pardonable alliance indeed, but objectionable inasmuch as the former when typical is always in some sense or other a stratified rock; the latter, when typical, always to be traced back to a member of the peridotite group, which, like the dolerites, are of igneous origin. I am aware that this last statement will be disputed by some mineralogists, but I am perfectly confident of its accuracy as long as the terms are used in an exact sense. With regard to serpentine, indeed, there have been found mineralogists who in preference to this obvious and natural derivation from a peridotite have claimed for it a parentage, by some strange process of metamorphism or rather methylosis, from gabbro, diorite, hornblende-schist and the like, nay even from granulite and granite. Now confusions like these arise from the mental habit to which I have already alluded; too great concentration on minutiæ has prevented the investigator from grasping the problem as a whole; the processes of change are neither apprehended in their progressive aspect nor duly weighed in the scale of probabilities; while superficial similarities blind the eyes to underlying dissimilarities. I have noted more than once that such a one has taken up this question without attaching any definite meaning to the terms

which he is using, and is asserting transmutations from one rock to another without giving any evidence (nay, with the strongest indirect evidence to the contrary) that he has ever brought to a crucial test those parts of the rock where the key of his position is hid; nay, apparently he not seldom appears to have undertaken the investigation without any knowledge that such a key must exist, and that it is his bounden duty to find it.

I trust I may be forgiven for the bluntness of these remarks; but, after devoting for some fourteen years all the time and money I could spare to trying to come at the truth in petrology, I may perhaps be forgiven for complaining that we petrologists receive as large a proportion of crude speculations and of unproved and unprovable statements from mineralogists, who should be exact investigators and close reasoners, as we do from the field-geologist, who barely knows quartz from felspar, and regards a microscope much as a certain person looks upon holy water. That this has happened, and that the science of mineralogy is in some other respects less progressive than it should be, is, I believe, largely due to those two defects to which I have ventured to call your attention.

Fine Crystals of Pale Lilac Calcite from Tankerville Mine, near Shelve, Shropshire.

By R. H. Solly, F.G.S., Demonstrator in Mineralogy to the University of Cambridge.

[Read October 21st, 1884.]

THE rare occurrence of the primitive rhombohedron *r* {100} with little or no modification on crystals of calcite has induced me to bring to the notice of the Society some very fine pale lilac crystals exhibiting this unusual habit.

These specimens were raised a few years ago from the Llandeilo flags strata in the Tankerville lead mine, near Shelve, Shropshire.

Usually the crystals are in small groups, not more than three or four together, and these are invariably twinned as penetration twins according to the law *o* {111} as twin-plane, and somewhat resemble twins of fluor spar, from the even development of the *r* {100} faces.

On these specimens the {100} faces are nearly equally developed, and are only modified by the scalenohedron *v* {20$\bar{1}$}, a narrow plane about a sixth of the size of the *r* planes. They often measure 11 mm. along the morphological axis, and a little less in a direction at right angles (fig. A.).

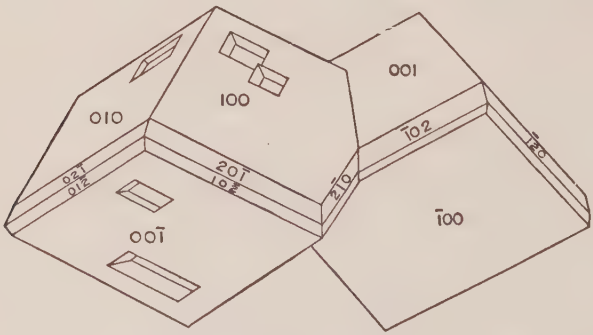

Fig. A.

Small limpid crystals of quartz coat the *v* planes, while on the *r* planes it is rare to find even a single crystal of quartz, though minute ones are found dispersed throughout the crystals.

The *r* planes are dull and slightly corroded, and often have cleavage rhomb-shaped pits on their faces, while the *v* planes are bright and

smooth, the quartz crystals having acted as a protection to the corroding fluid which destroyed the lustre of the *r* planes; but why the quartz crystals were deposited on the *v* planes by preference is apparently inexplicable.

A cleavage fragment was detached from one of the specimens, and after careful selection, a small brilliant fragment was measured on a Fuess goniometer, with the highest power. It gave a very bright reflection of the Websky slit, and the following readings.

The faces were within half a minute parallel to one another, and the two brightest images gave

$$rr\ 105° 4\tfrac{1}{2}'.\quad \text{Miller, } rr\ 105° 5'.$$

The scalenohedron form was determined from the crystal itself across *bb''*

$$v\ \bar{v} = 47° 30'.\quad \text{Miller, } v\ \bar{v}\ 47° 2'.$$

Since these specimens were raised, a very fine mass of crystals has been found in the same mine; this is worth describing.

It measures about two yards in circumference; the matrix is a thick layer of stout limpid quartz crystals, on which are deposited some half-a-dozen fine large crystals of lilac calcite, slightly polysynthetic in growth, similar to those described above; and also three or four large polysynthetic cubes of galena about one and a half inches square, beautifully tarnished, associated with a little copper pyrites and brown blende crystals. About the same time fine limpid white botryoidal calcite was discovered at the Roman Gravels, a mine adjoining. A fine specimen of calcite from the Camborne district, Cornwall, unique of its kind, is in the possession of Mr. Thos. Cornish, of Penzance. The crystals are white and semi-transparent, exhibiting the same development as those from the Tankerville mine. They are about an inch in diameter, and speckled on one side only by brilliant tetrahedra of copper pyrites.

The description of these specimens leads to a consideration of the cause of the numerous simple and modified forms of calcite. Dr. Irby, in his monograph on calcite, says that only one-seventh of the specimens he has examined have *r* {100} in combination with other forms, and as a simple form it is extremely rare.

Credner also found, when making artificial crystals of $CaCO_3$, that *r* {100} predominated more frequently over the other forms when the crystals were obtained from pure solutions than when foreign substances were introduced. But the question arises, why should a trace of *Mn* be generally found in *r* {100} crystals, as shown by the Tankérville, Iceland and Dauphiné crystals; also why should a trace of *Mg* be generally found in *e* {100} crystals, as shown by the "nail-head" calcite of the north country,

and a trace of *Fe* in *v* $\{20\bar{1}\}$ crystals, as shown by the "dog-tooth" scalenohedra of Derbyshire?

Possibly the answer may be that an infinitesimally small portion of an isomorphous chemical substance, when chemically combined, is able to induce a particular form.

Credner's experiments on the highly modifying influence of silicate of potash when introduced into the liquor, by which he caused numerous forms to grow on his artificial crystals of calcite, led him to infer that the presence of analcime with the crystals of calcite at Andreasberg and Lake Superior played the same part in the laboratory of Nature.

But the common "cannon spar" (hexagonal prism with basal plane) from the silver mines of Andreasberg is associated with the same minerals as the highly modified specimens. It seems, therefore, that we require more instances before accepting this proposition.

Another explanation offers itself in the effect of mechanically mixed impurities in modifying the form of a crystal, but the difference between the *density* of the impurity and that of the crystal may also affect the modification. For the large inclusion of quartz (sp. gr. 2·65) in the Fontainebleau calcite crystals (sp. gr. 2·72), and the fairly numerous crystals of quartz in the Tankerville crystals seem to accompany a simple form, while the native copper (sp. gr. 8·7) enclosed in the calcite crystals of Lake Superior accompanies very complicated forms. Or the answer may be that impurities, whether chemically or mechanically mixed, have little or no modifying influence, and the rate of deposition or the temperature of solution is rather the ruling force which governs the ultimate form or forms.

The crystallisation of certain artificial salts seems to show that the slower the growth the greater is the modification.

Again, the liquor in which a crystal is grown sometimes governs the form, as seen when crystals of alum are formed in urine, since alum crystals when grown in this manner give cubes, and rock salt octahedra.

The experiments on variation of temperature in modifying the form of artificial crystals seem to point to a complexity of form accompanying increase of temperature.

The result of the numerous experiments on the dimorphism of $Ca\,CO_3$ makes it difficult to allow that the temperature, rate of deposition, or inclusion of impurities, are the whole cause of the numerous simple forms in calcite, since these experiments show that crystals of aragonite are formed at a high temperature, and even at a low temperature when the liquor contains gypsum or strontian.

There is still another cause to be mentioned—the effect of magnetic and electric currents on the growth and form of crystals—forces which after all may have more to do with the ultimate form than either temperature, rate of deposition, impurities, &c. We seek, alas, in vain for assistance in solving the question from any laboratory experiments at present published.

Thus all experiments on growing artificial crystals do not help us to understand why calcite should crystallise in different simple forms, which are characteristic of certain localities; though the fact may possibly be accounted for by the different degrees of resistance that the beds and vein-stone may offer to the magnetic or electric currents while the crystals are growing.

Description of a Crystal of Parisite.

By Monsieur Guyot de Grandmaison.

[Exhibited October 21st, 1884.]

OCCURRENCE. At the Emerald Mines of the Valley of Muso, New Granada, in a gangue composed of anthracitic calcite and pyrites.

Lustre, vitreous to resinous; colour, yellowish brown to honey-yellow.

An acute hexagonal pyramid with striations perpendicular to the axis.

The crystal measures 34 millim. in length, and 12 millim. in thickness at the base.

The pyramid is perfect and its apex is intact.

All the specimens of Parisite which have been hitherto received, and are found in European Museums, exhibit a truncated hexagonal pyramid. This section is due to a very easy basal cleavage.

Further Notes on Enargite.

By W. Semmons.

[Read October 21st, 1884.]

WHEN I submitted my Paper on Enargite (*Min. Mag.* Vol. vi. p. 49) to this Society, I was unable to give the exact locality of the mineral. As the territory of Montana embraces a considerable extent of land, I was therefore desirous of ascertaining the position of the mines yielding the ore.

Having during the past summer had the opportunity of visiting the locality, I am now able to give some further particulars.

I have found it at the Liquidator Mine in Silver Bow county, near Butte City, also at the Gaquon mine. At the Liquidator it is associated with iron pyrites, Covelline, and Bornite, and seems to constitute a large proportion of the ore raised.

At the Gaquon mine it is associated with chalcocite containing silver. I did not find any at the famous "Anaconda" mine; but as they were then working on the rich lead of the lode (only a portion thereof) which was almost a pure chalcocite, containing about 35 oz. silver per ton, it is quite possible that the mineral will also be found there.

I also found it in the Parrot and Colusa ores, although these are as a rule free from arsenic.

The mineral therefore seems rather widely diffused, and as I was informed on good authority that it was also found near Marysville, in Lewis and Clark county, it is probable that it is rather a common ore in the district.

The specimens from the Gaquon mine are interesting, as they show several crystals. Some are rhombic prisms about $\frac{1}{8}$ inch across and $\frac{1}{4}$ long, with only the prism and basal pinacoid developed, while others are truncated, and thus give some planes of the pyramids. The very perfect cleavage and deep striations are characteristic of the mineral throughout the district.

As these deposits of Montana are comparatively superficial, I searched very earnestly for some indications of decomposition and its results; for, as all mineralogists well know, it is here we may look for interesting and new compounds. I was unable to meet with any thing however in the locality, but in some ores from the Mammoth Copperopolis mine in Nevada, where

I also found some Enargite in a decomposed state, we meet with several minerals of extreme interest.

I have here specimens of olivenite, Chenevixite, Cornwallite, conichalcite, from this mine, also probably Bayldonite, though as I have only the simple blowpipe tests to rely on, which confirm the rough determinations of my mining friends in America, I do not feel certain that all these names will be maintained after chemical analysis. They are undoubtedly hydrated arseniates of copper, and some contain lead. Olivenite and Chenevixite are certainly there, but as for the others I am not positive, though I do not care to dispute the miner's determination; cacoxenite also appears to be present.

About ten years ago, a sample parcel of ore from Mammoth Copperopolis was sent to Liverpool, which yielded a high percentage of copper. From this I obtained azurite, chrysocolla, and another copper mineral which then puzzled me extremely. I found it was an arseniate of copper with chloride of copper intermixed. It was with pleasure I found, about two years since, that there was an almost similar specimen at the British Museum, labelled Cornwallite. It is probable, therefore, that a considerable quantity of this mineral has been raised during the past decade from Nevada.

Enargite has thus been found in most of the states and territories lying about the range of the Rocky Mountains, and I fully expect to hear of our American friends finding some remarkable combinations, when this ore is found in close proximity to their seemingly boundless deposits of lead minerals.

Some Occurrences of Actinolite in Scotland.

By Rev. W. W. Peyton.

[Read June 24th, 1884.] (Abstract.)

IN this Paper the author directs attention to some localities in Scotland where the actinolite forms of hornblende are to be found.

In Aberdeenshire the actinolite occurs as sheaf-like groups, irregularly distributed through a felspathic base; also as slender crystals, extending sometimes to the length of eighteen inches, in a dioritic rock. On the hill of Heshgarnich, in Perthshire, this variety of hornblende occurs in nests, also in fan- or sheaf-like bundles of a black colour; and on the north side of the hill it is found in blade-like forms distributed through a glistening micaceous schist.

Various textured schists in Strathmore enclose irregularly distributed crystals, which are mostly small and dark green in colour.

A whitish unctuous schist in the vicinity of Blairgowrie, Perthshire, contains innumerable crystals of a colour ranging from dense green to almost black.

About two miles from Portsoy, Banffshire, a black micaceous schist occurs, in which the similarly coloured actinolite forms a glistening constituent. The actinolite here resembles that of some of Strathmore.

The gneissose rocks of Colefirth Voe, Mainland, Shetland, in addition to the ordinary hornblende forms, contain sheaf to fan-like and also acicular actinolite.

Observations on the Preparation of Mineral and Rock Sections for the Microscope.

By John Ernest Ady.

[Read December 9th, 1884.]

DURING the past few years the study of the minute structure of minerals and rocks has received the attention of so many able geologists, that microscopical mineralogy and petrography may now be regarded as a fairly established means for the identification and diagnosis of inorganic species. As a special instance, I may point to Heddle's researches on Amazonstone,* where the discrepancy of its chemical constitution from normal orthoclase, and its aberrant crystalline form, are accounted for under the microscope, with polarised light, by minute structural peculiarities which support the view that it is composed, not of orthoclase and albite, as has been supposed, but of orthoclase and a paragenetic constituent, allied to, if not identical with, oligoclase.

I propose to confine my remarks to the preparation of hard substances which do not require any special previous or after treatment to enable them to withstand the mechanical methods to which they are subjected. There are many trifling details of manipulation, the neglect or observance of which suffice to draw the line between failure and success. By the term failure I intend to imply that slovenly habit of securing a thin fragment of a section and mounting it anyhow, with clinging particles of dust and dirt, to which such errors of observation as a detailed description of rough surfaces, rugosities, striæ, cavities filled with unknown products, and a variety of other conflicting evidences, are to be attributed; whereas a successfully prepared section, in the hands of a faithful recorder, can only contribute to the advancement of science.

Although my present communication will not involve any novel principles, I trust that, by a formulated outline of the best known methods, divested of all unnecessary and extravagant details, and supplemented by practical notes, to place before the Society the most noteworthy results of my experience.

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* *Trans. Roy. Soc. Edin.*, Vol. XXVIII. p. 197 *et seq.*; *Min. Mag.* Vol. V. 1883, p. 160 *et seq.*

The first operation in the preparation of sections is to secure a slice of the mineral or rock. In the former case, it is obvious that for purposes of investigation a definite series of sectional planes should be selected; in the latter instance, especially in very finely-textured rocks, without any natural or superinduced peculiarities, such as occur in finely laminated examples, slates, schists, &c. or the presence of specially developed and local particles, the plane of section is immaterial, and a chip taken with a hammer may often suffice. The process of slicing by hand, with emery powder and a toothless tenon-saw, is both tardy and extremely laborious. The employment of a slitting machine, fitted with a diamond-charged disc of soft iron (the so-called block tin), is an accomplishment which requires considerable practice, and indeed is not worth while adopting for the production of a few occasional slices, except to gratify the whim of the worker, since they can be both efficiently and inexpensively cut by any good working lapidary.*

The reduction of the slice may be accomplished by hand, or with the aid of a grinding bench. In either case, the processes are essentially the same; the result to be aimed at is, a section of the desired thickness, which shall be perfectly even and free from superficial scratches. The tenuity of the preparation must of course be regulated by the special requirements of each case; as a rule, however, the thinner a slice can be made, the more valuable it becomes to the general investigator, especially with high powers of the microscope; minute endomorphs, cavities, and traces of fluidal structure may thus be revealed, and inferences often of great importance deduced therefrom. Sections of finely textured and dark rocks, such as the majority of the basalts, dolerites, &c., may be roughly gauged by placing them over a sheet of ordinary printed matter; if the typographical characters can be readily distinguished, the specimen may be regarded as sufficiently thin. Another somewhat more reliable ready expedient is, to hold the preparation near to the eye between it and a window or other object illuminated by diffused light; if the outlines of the window-frame and bars can be easily distinguished, the section may be taken to be adequately thin. Translucent and transparent minerals, or rocks composed of a large proportion of such constituents as quartz, clear felspar, or calcite, may be reduced until the darker minerals with which

* I usually mark my mineral specimens with lines of ink, to which a little mucilage has been added, to indicate the directions along which I desire to have them sliced. Rocks and dark opaque minerals may be marked with a fine camel's hair brush dipped in artist's oil-vermilion, reduced to a suitable consistency with benzol.

they are generally associated, *e.g.* hornblende, mica, schorl, augite, &c. become almost transparent. In themselves, however, the intensity of chromatic effect, when viewed with polarised light under a low power of the microscope, is a sufficient test. A basalt thus examined ought to reveal the intimate structure of its interstitial groundmass, and the granular condition of its augite ought also to be clearly defined; whilst the closely aggregated patches of dark spicular schorl in the variety Luxulianite should be resolvable into stellate groups, each with distinct radii. The individual grains of limestones and sandstones ought to lie in a single layer, so as to avoid interference phenomena, and the fluid cavities of milky quartz admit of coming into focus under the highest magnifying powers that are of any use.

The mode of preparing hard sections is briefly as follows :—The slice or chip must be ground absolutely level and perfectly smooth on one side ; it is not necessary to polish the face. The smooth facette may thereafter be firmly cemented on to a suitable piece of glass, and the other side then reduced until a sufficiently thin section is obtained. To do this by hand, a few soft metal plates, preferably of pewter, zinc, copper, or lap-metal, each about 12 inches square, and $\frac{1}{4}$ inch thick, three sizes of emery powder, and one or two Water-of-Ayr hones, are in reality all that is necessary. Glass plates are not to be tolerated, since they rapidly wear away irregularly unless extreme care is taken. For the final operation of grinding, flour emery which has been used and washed, or mirror-polishers' powder, is to be preferred.

(I.) Oakey's No. 60 hole emery powder with a little water should be used upon one of the soft metal plates, and the slice may by a small circular motion over each quarter of the plate, and a gradual transition into a greater circular motion thereafter around and towards the centre of the plate, be ground coarsely level on one side, and prevent the plate from wearing away into hollows. This operation should be repeated on another plate with No. 80 hole emery, and then on another with flour emery ; care should be taken to wash the section thoroughly each time before using emery of a different size.

To produce a perfectly flat face upon the slice, the surface of the plates should be slightly raised at their centres so as to be somewhat convex. This may be produced by heating the central part over a spirit or Bunsen flame, when the four corners of the square will tend to bend slightly downwards, and give the desired degree of convexity to the upper grinding surface. The plate may then be fixed upon a support of wood

covered with a layer of plaster of Paris, so as to prevent a springing motion during the process of grinding.

(II.) The use of flour emery will secure a tolerably smooth surface, free from any serious scratches or roughness; but it is advisable to make use of a Water-of Ayr hone, with a plentiful supply of water, in addition, to ensure success. Indeed, *two* hones may be advantageously employed, and their surfaces are to be specially prepared beforehand thus:—The first hone, about 6 inches long and $1\frac{1}{2}$ inches in breadth, is to be rubbed rapidly from end to end, longitudinally in one direction, upon a level slab of fine sandstone. This will develop a slightly convex surface upon the hone. The second hone, of similar proportions, must be treated in the same way, but it should in addition be further rubbed upon a slab of fine marble, so as to secure a smoother surface also slightly convex. The value of a convex grinding or polishing surface where the pressure is applied by the hand has long been known to practical mechanicians, for it is upon this principle that the so-called engineer's file is constructed. To the neglect of this item may be traced the cause of those inequalities which result in a section thick towards the centre and thin at the edges.

(III.) In fastening the smoothened surface of the slice to a piece of glass, the best cement substance I have found for the purpose is that made of an admixture of Venice turpentine and orange shellac. The turpentine should be heated in a sand or water bath, and enough shellac ought to be added to it to produce on cooling a thoroughly hard yet tough solid; it may be tested from time to time by the removal of a small portion. The advantages of this cement are manifold: it is not prone to imbed particles of emery during the processes of grinding, its adhesive properties are exactly suited to the requirements of the case, and it is perfectly soluble in ordinary methylated spirit. By surrounding the edges of the slice with a small quantity of the cement, the borders of the latter will be perfectly protected.

The slice ought to be fixed on to the small preliminary square of glass, with the fastening substance melted upon it over a spirit or Bunsen flame; it should be firmly pressed upon the glass slip (which, by the way, is all the better for being made of the best flattened plate glass, about $\frac{1}{4}$ inch thick, and $1\frac{1}{4}$ inches square) to the entire exclusion of air-bubbles.

(IV.) The process of reduction may be carried on with Nos. 60 and 80 hole emery powder, until in dark specimens, *e.g.* basalts, &c., the slice becomes translucent. Flour emery may then be used, and the final touches given upon the Water-of-Ayr hones. During the latter stages, the specimen ought to be repeatedly examined under the microscope.

(V.) All that is necessary now is to remove the finished section from the preliminary slip of glass. This may be best accomplished by soaking it in a saucer full of methylated spirit. The slice ought to float off of itself in the course of a few hours; it must not any account be forced off. After detachment, it should be transferred to a dish of clean spirit for an hour or so, and gently washed therein with a fine camel's-hair or sable pencil.

(VI.) From the clean spirit the slice should be removed by means of a special lifter (a fine brush or stout needle will do), and placed between slips of clean white tissue paper, where they will dry rapidly and be ready for mounting.

(VII.) The best mounting fluid for rock sections is a filtered solution of equal parts of Canada balsam and gum damar in pure benzol. Hardened Canada balsam dissolved in benzol and filtered may also be used. A drop of the solution ought to be placed upon a clean warmed slip of glass, the section placed therein covered with another drop, and laid aside for about 10 or 12 hours in a dust-proof box, or under a bell glass. This process, which I have described elsewhere as the "*exposure method*," permits the medium to assume a suitable consistency before the cover glass is applied to the preparation. After exposure, a fresh drop of balsam may be placed upon the section, and a gently warmed cover glass lowered upon the whole.

I may state that balsam prepared in the manner indicated, and used after the method I have described, will enable the operator to cleanse his preparation of all superfluous balsam *immediately* after he has placed the cover glass thereon, by simply rubbing it with a rag dipped in methylated spirit. Air bubbles and vacuoles, moreover, may be disregarded, as the nature of the medium is incompatible with their persistence.

The labour of grinding sections of minerals and rocks for the microscope by hand is so tedious, that few persons would follow that process where they could resort to a suitable grinding bench. Many instruments have been devised for this purpose, the best one in the English market being that of Messrs. Cotton and Johnson, and called the "Amateurs' Lapidary Machine." There is room, however, for vast improvements in instruments of this kind; those that are now made for scientific inquirers are either too expensive or mere toys; whilst working lapidaries use benches which require almost a term of apprenticeship to enable one to manage them. What is wanted by the petrologist is a thoroughly good machine with a horizontally disposed fly-wheel, treadle action, firm steady bearings, and the entire system so arranged as to admit of the ready change of laps, and the cleanly application of emery with the greatest possible utility.

I am glad to be able here to describe a machine which fully meets all the wants I have just enumerated, and which has hitherto remained unnoticed. With its aid several hundreds of sections of the most perfect description were prepared in illustration of my journal on microscopical petrography.

The vertical treadle motion is modified into a powerful horizontal one by means of a strong cord passed over a pulley, and attached to the crank of a fly-wheel. A connecting strap transfers the motion of the fly-wheel to a small horizontally placed spindle-bearing wheel. The lower end of the spindle works upon a fixed iron bearing, whilst its upper extremity is free and slotted to receive the central attachment pins of the grinding discs. The circular grinding discs are provided with cylindrical rod-like attachment pins screwed into the centres of their lower faces at right angles thereto; they are simply allowed to slide into the receiving slot of the spindle-head, and can therefore be readily changed; their weight, and the pressure applied to their upper surfaces during the process of grinding, are sufficient to maintain them firmly. The fly-wheel works between two metal bearings supported by a strong framework, which can be made to slide forwards or backwards in the body of the bench by working a large adjustable wooden screw; thus, when the connecting strap becomes somewhat slack, it can be speedily tightened by merely turning the screw-head.

Before placing the lap into the slot of the spindle-head, the waste emery box must be placed around the latter, and over this a protecting metal cup-shaped cap is slid to prevent the possible passage of dirt to the working parts of the instrument.

Lastly, the subjoined figures with explanatory notes and measurements will show the details of this new lapidary's lathe far better than any verbal description alone. It may be taken as a working plan.

EXPLANATION OF PLATES.

Plate III.—Diagrammatic Sectional Drawing of Lapidary's Lathe for Petrographical Work. *T.*, Top of table; *u.u.*, upright supporting legs; *J.*, middle joist; *tr.*, treadle; *cd.*, cord of treadle passing over pulley wheel *(p.w.)* to crank *(cr.)* of fly-wheel *(f.w.)*; *st.*, strap from fly-wheel to spindle-bearing wheel *(sp.w.)*; *Sp.*, upper end of spindle; *Sp.* 1, lower part of spindle resting on bearing *(Sp. B.)*; *u.b.*, and *l.b.*, upper and lower bearings of fly-wheel, sunk in sliding-frame *(fr.)*, which can be regulated by wooden screw *(w.s.)*. The lower bearing, along with the inferior arm of the sliding frame, move in a limited groove in the joist *(J)*, which is specially morticed at this part.

Plate IV.—Enlarged Diagram of Grinding Apparatus. *i.*, Circular brass ring bordering aperture for upper end of spindle *(Sp.)*; it is provided with an upward projecting rim. The brass cap *(c)* acts as a steadying bearing to the spindle head *(Sp.)*; *i'.*, circular metal ring with upward projecting rim fastened on edge of central aperture of waste emery box *(b)*; the brass protecting cap *(p)* comes over the edge of this rim, and is apposed above to the free extremity of the spindle-head, thus effectually preventing the entry of dirt to the bearing *(c)*; *i''.*, iron pegs for securing box *(b)* in its place. *L.* lap, or grinding disc; *a.*, attachment pin of lap, is somewhat conical, and does not quite fill the slot *(s)*; thus providing a grip which tends to become more firmly fixed during the process of grinding.

WORKING MEASUREMENTS.

Table	Height	38 inches.
	Length	40 inches.
	Width	20 inches.
Distance of joist *(J)* from top of table		6 inches.
Distance of spindle from nearest supporting leg *(u)* ...		5 inches.
Diameter of fly-wheel		16 inches.
Diameter of spindle-bearing wheel		6½ inches.
Diameter of pulley wheel		5½ inches.
Length of arms of sliding frame *(fr)*		10 inches.
Side of square waste emery box *(b)*		12½ inches.

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By H. A. Miers, M.A.

(Submitted to the Society December 9, 1884.)

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OILS. M. Boussingault. Ann. Chim. Phys. xxix. p. 363. *Chem.*

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	J. Bachmann. Mitth. Nat. Ges. Bern. p. 4. *Cryst.*
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Sphene.	W. Hankel. Abh. Sächs. Ges. p. 579. *Thermoel.*; and Pogg, xviii. p. 425.
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Steatite.	J. Dobbie. Min. Mag. v. p. 131. *Chem. Glasgow.*
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Sylvine.	K. Koch. Pogg. xviii. p. 325. *Elasticity.*
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Thorite.	L. Nilson. Ann. Chim. Phys. xxx. p. 429. *Chem.*
Topaz.	G. Kunz. Proc. Am. Ass. p. 271. *Stoneham.*
	G. Seligmann. Verh. Nat. Ver. Rheinl. Corr. Bl. p. 100.
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Torbernite.	W. Rice. Science, i. p. 601. *Connecticut.*
Tourmaline.	P. Franco. Rendic. Ac. Nap. p. 117. *Elba, Molybdeniferous.*
	J. Collins. Min. Mag. v. p. 121. *Cornwall, Chem.*
	G. Kunz. Proc. Am. Ass. p. 274. *Maine.*
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Ullmannite.	C. Klein and P. Jannasch. N. J. (1), p. 180.
Vauquelinite.	N. Kokscharow. Bull. Ac. St. Pet. xxviii. pp. 23, 267 *Cryst.*
Veins.	v. Metalliferous Veins.
Vesuvius.	P. Franco. Rendic. Ac. Nap. p. 1 (*Mte. Somma*). *Minerals of.*
Wermland.	L. Igelström. öfv. Vet. Ak. Förh. 7, p. 91.
Witherite.	W. Hankel. Abh. Sächs, Ges. p. 572. *Thermoel.*
Wulfenite.	N. Kokscharow. Bull. Ac. St. Pet. xxviii. p. 284. *Cryst.*
	A. Lacroix. Bull. Soc. Min. p. 80. *Beaujolais.*
Xenotime.	G. Seligmann. Verh. Nat. Ver. Rheinl. Corr. Bl p. 100.

LIST OF ABBREVIATIONS USED IN INDEX.

ABH. AK. BERL.	K. Akademie der Wissenschaften. Abhandlungen. Berlin.
ABH. AK. MÜNCH.	Abhandlungen der math-phys. Classe der k. bayerischen Akademie der Wissenschaften. München.
ABH. SÄCHS. GES.	Abhandlungen der math-phys. Classe der k. sächsischen. Gesellschaft der Wissenschaften zu Leipzig.
AM. J. SC.	The American Journal of Science and Arts. Newhaven.
AM. NAT.	American Naturalist. Philadelphia.
ANN. CHIM. PHYS.	Annales de Chimie et de Physique. Paris.
ANN. MIN.	Annales des Mines, &c. Paris.
ANN. NEW YORK AC.	Annales of the New York Academy of Sciences. New York.
ATT. AC. NAP.	Atti dell' Accademia Pontaniana. Napoli.
ATT. IST. NAP.	Atti del Reale Istituto d' Incoraggiamento. Napoli.
BER. AK. BERL.	K. Akademie der Wissenschaften. Sitzungsberichte. Berlin.
BER. AK. MÜNCH.	Sitzungsberichte der math-phys. Classe der k. Akademie der Wissenschaften zu München.
BER. AK. WIEN.	Sitzungsberichte der k. Akademie der Wissenschaften. Wien.
BER. GES. NAT. FR. BERL.	Sitzungsberichte der Gesellschaft naturforschender Freunde zu Berlin.
BER. NIED. GES. BONN.	Sitzungsberichte der nieder-rheinischen Gesellschaft für Natur-und Heilkunde. Bonn.
BER. OBERHESS. GES.	Bericht der oberhessischen Gesellschaft für Natur-und Heilkunde. Giessen.
BER. SÄCHS. GES.	Berichte über die Verhandlungen der k. sächsischen Gesellschaft der Wissenschaften zu Leipzig.
BER. SENCK. GES.	Berichte über die Senckenbergische naturforschende Gesellschaft. Frankfurt-a-M.
B. H. ZTG.	Berg-und Hüttenmännische Zeitung. Leipzig.
BIH. VET. AK. HAND.	Bihang till k. Svenska Vetenskaps-Akademiens Handlingar. Stockholm.
BULL. AC. ST. PET.	Bulletin Académie Impériale des Sciences de St. Petersbourg.
BULL. SOC. MIN.	Bulletin de la Société Minéralogique de France. Paris.
CAMB. PHIL. SOC.	Cambridge Philosophical Society. (Transactions and Proceedings.) Cambridge.
CAN. NAT.	Canadian Naturalist, &c. Montreal.
CHEM. CENT. BL.	Chemisches Central-Blatt. Hamburg und Leipzig.
CHEM. NEWS.	Chemical News, &c. London.
C. R.	Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences. Paris.

FORH. VID. SELS. CHRIST. Forhandlinger i Videnskabs-Selskabet i Christiania.

JAHRB. GEOL. REICHS.	Jahrbuch der k.k. geologischen Reichs anstalt. Wien.
JAHRB. L. MUS. KÄRNT.	Jahrbuch des naturhistorischen Landes-Museums von Kärnten. Klagenfurt.
J. AS. SOC. BENG.	Journal of the Asiatic Society of Bengal. Calcutta.
J. PRAKT. CHEM.	Journal für praktische Chemie. Leipzig.
LIEB. ANN.	Liebigs Annalen der Chemie Leipzig und Heidelberg.
MÉM. AC. SC.	Mémoires de l'Académie des Sciences de l'Institut de France. Paris.
MEM. IST. LOMB.	Memorie del reale Istituto Lombardo, &c. Milano.
MÉM. PRÉS. AC. SC.	Mémoires présentés a l'Académie des Sciences de l'Institut de France. Paris.
MIN. MITTH.	Mineralogische und petrographische Mittheilungen. Wien.
MITTH. GEOG. GES. WIEN.	Mittheilungen der k.k. geographischen Gesellschaft. Wien.
MITTH. NAT. GES. BERN.	Mittheilungen der naturforschenden Gesellschaft. Bern.
N. CIM.	Il Nuovo Cimento. Pisa.
N. J.	Neues Jahrbuch für Mineralogie, Geologie, und Palaeontologie.
OFV. VET. AK, FÖRH.	Ofversigt af Kongliga Vetenskaps-Akademiens Forhandlingar. Stockholm.
OV. DANSK. SELS. FÖRH.	Oversigt over det k. danske videnskabernes Selskabs Forhandlinger. Copenhagen.
PHIL. MAG.	London, Edinburgh and Dublin Philosophical Magazine, &c. London.
POGG.	Annalen der Physik und Chemie. Leipzig.
PROC. AC. PHIL.	Proceedings of the Academy of Natural Sciences. Philadelphia.
PROC. AM. ASS.	Proceedings of the American Association for the Advancement of Science. Salem.
PROC. BOS. SOC.	Proceedings of the Boston Society of Natural History. Boston.
PROC. ROY. DUB. SOC.	Scientific Proceedings of the Royal Dublin Society. Dublin.
RENDIC. AC. NAP.	Rendiconto dell' Accademia delle Scienze Fis. e. Math. Napoli.
REV. D. MIN.	Revue Universelle des Mines, &c. Paris et Liége.
SCHR. NAT. VER. SCHLES.-HOLS.	Schriften des naturwissenschaftlichen Vereins für Schleswig-Holstein. Kiel.
SCIENCE.	Science. Cambridge, Mass.
TRANS. ALB. INST.	Transactions of the Albany Institute. Albany, U.S.

TRANS. NEW YORK AC.	Transactions of the New York Academy of Sciences. New York.
VERH. NAT. GES. BASEL.	Verhandlungen der naturforschenden Gesellschaft. Basel.
VERH. NAT. VER. RHEINL.	Verhandlungen des naturhistorischen Vereins der Preussischen Rheinlande und Westphalens. Bonn.
VET. AK. HAND.	Svenska Vetenskaps-Akademiens Handlingar. Stockholm.
ZS. K.	Zeitschrift für Krystallographie und Mineralogie. Leipzig.
ZS. NATURW. HALLE.	Zeitschrift für Naturwissenschaften. Halle.

Beil. Bd.	Beilage Band.
Corr. Bl.	Correspondenz Blatt.

Assoc.	Associated.
Chem.	Chemical.
Cryst.	Crystallographical.
Elect.	Electric.
Loc.	Local or Locality.
Min.	Mineral or Mineralogical.
New Min.	New Mineral.
Opt.	Optical.
Pyroel.	Pyro-electric.
Thermoel.	Thermo-electric.
Therm.	Thermic.
Var.	Variety

Abstracts and Notes.

THE *Variolite of Jalguba, Government of Olonetz, Russia.* Lawinson-Lessing, of St. Petersburg, has microscopically and chemically examined (*Min. Mitth.* B. VI. s. 281, 1885) the variolite found *in situ* near Jalguba Bay, Lake Onega. Prof. Inostranzeff had already compared sections of this rock with the variolite pebbles of the river Durance, France, in 1874. At Jalguba, it occurs associated with diabasic (doleritic) rocks, varying in texture from that of a typical diabase to aphanitic and porphyritic varieties. Gabbro, or euphotide, which are its usual associates, according to the French geologists, are not found here, but the variolite is surrounded or encircled on all sides by the diabase. From the microscopical investigation, the author recognises four types which are characterised by differences in structure and colour. These types are as follows :—

Type I.—The variolæ and groundmass are similarly coloured and of similar structure (excepting the radial structure of the variolæ). The former contain much glass, the radii are feebly developed, and sometimes pass insensibly into the groundmass.

Type II.—Has a structure similar to that of type I., but the colour of the variolæ is of a clear brown, while that of the groundmass is green.

Type III.—The variolæ are entirely crystalline, and are separated from the groundmass by a dark periphery, forming the typical variolite. Colour similar to type II.

Type IV.—Structure and colour entirely differing from the preceding types ; the variolæ are of a grayish-brown, and the groundmass green.

In types III. and IV. the groundmass is peculiar, from the abundance of devitrification products ; and there are intermediate varieties. The author gives the name variolite-aphanite to one form of this rock which is very abundant at Jalguba. Under the microscope, a system of felspar radii obscured with numerous augite crystals is seen to pervade a clear brown glassy groundmass. This system is resolved into individual radial fibrous groups (tufts) resembling variolæ, but which are anastomosed together, leaving only a slight amount of interstitial glass. This seems to constitute an intermediate stage between diabase and typical variolite. Its characteristics are—a clear brown glassy groundmass, enclosing brown grains, strands, and other devitrification products, felspar radii, augite,

and magnetite. Detailed descriptions of the microscopical characters of the varieties of this variolite are given, and also analyses showing its relation to the diabase. Separate analyses also are given of the variolæ and of the groundmass, confirming the results already arrived at by Delesse, Michel-Lévy, and Von Gümbel, that the former are richer in silica and poorer in alumina and magnesia than the latter.

The author sums up as follows :—

1. At Jalguba, the variolite-aphanite and the typical variolite must be differentiated.

2. The typical variolite falls into two principal groups : (*a*) variolite with the variolæ and groundmass of the same colour, and (*b*) having the variolæ and groundmass of different colours. Each of these groups contains (*a*) having much glass, with variolæ only distinguished from the groundmass by the felspar radii, and (*b*) having a complicated groundmass and completely crystalline variolæ.

3. The principal constituents of these rocks are plagioclase, augite (and a glassy felspar-paste) ; those accessory are chlorite, epidote, magnetite, with quartz and calcite as fissure-filling minerals.

4. The most important structure is that of the felspar rays of the variolæ.

5. The different chemical constitution of the variolæ and of the groundmass is due to the predominance of the felspar in the first, and the pyroxene in the last.

6. The variolites must be grouped with the diabases.

7. The variolite structure is not the result of special chemical combination, but is due to an unknown exterior cause, "contraction through sudden cooling ?" (Erstarrungsgeschwindigkeit ?)

8. The variolite of Jalguba resembles in variety of texture, &c. all those hitherto known.

T. D.

G. vom Rath. *Mineralogische Notizen* (*Verh. des Naturh. Vereins d. preuss. Rheinl. u. Westf.* 1884, p. 290).

These notices contain the following four papers :—

1. *On Quartz from North Carolina.* The crystals occur with finely crystallised examples of other minerals in druses or "pockets" from the localities which have furnished emeralds and the beautiful variety of Spodumene known as Hiddenite. They resemble in appearance the peculiar quartz from Zöptau, in Moravia, described by Prof. vom Rath in

Zeitschrift für Krystallographie, Vol. V., but are characterised by the frequent occurrence of well-developed faces of the forms $3\ R\ \{7\bar{2}\bar{2}\}$ and $-\frac{3}{2}\ P\ \frac{3}{2}\ \{21\bar{1}\}$.

The new forms observed are—

$-\frac{1}{16}^{9}\ P\ {}^{1}\!/_{3}^{9}\ \{17\ 1\ \bar{2}\}$

$-\frac{7}{2}\frac{4}{1}\ P\ \frac{7}{5}\frac{4}{3}\ \{116\ 53\ 10\bar{6}\} = -\frac{7}{3}\ P\ \frac{7}{5}\ \{11\ 5\ \bar{1}0\}$ (?)

$-\frac{1}{3}\ R\ \{441\}$

$-\frac{5}{2}\ P\ \frac{5}{3}\ \{31\bar{2}\}$

The crystals are frequently compound, consisting as usual of two individuals interpenetrating in inverse positions; this twin structure is traced in the paper with considerable detail; on one such crystal the rhombohedron face $3\ R\{7\bar{2}\bar{2}\}$ is replaced by $-2\ R\{11\bar{1}\}$ and $-8\ R\{33\bar{5}\}$ instead of by $-3\ R\ \{44\bar{5}\}$ as is usually the case, and it is singular that G. Rose found a similar peculiarity in Swiss twins in which the same face $3\ R$ is replaced by $-\frac{7}{4}\ R\ \{33\bar{4}\}$.

Among many others, two crystals of particularly curious appearance are described; one closely resembling calcite in habit, a combination of the forms $\infty\ R\ \{\bar{2}1\bar{1}\}$, $R\ \{100\}$, $-\frac{1}{3}\ R\ \{441\}$, $-\frac{1}{2}\ R\ \{110\}$, $-R\ \{22\bar{1}\}$, capping an ordinary crystal of quartz; the other characterised by a remarkable development of the faces $2\ P\ 2\ \{41\bar{2}\}$, $-3\ P\ \frac{3}{2}\ \{52\bar{4}\}$, $-\frac{1}{3}^{0}\ P\ \frac{1}{7}^{0}\ \{16\ 7\ \bar{1}4\}$, $-\frac{1}{3}^{1}\ P\ \frac{1}{8}^{1}\ \{17\ 8\ \bar{1}6\}$, $-4\ P\ \frac{4}{3}\ \{2\bar{1}2\}$, $-\frac{9}{2}\ P\ \frac{9}{7}\ \{13\ 7\ \bar{1}4\}$, $-6\ P\ \frac{6}{5}\ \{8\ 5\ \bar{1}0\}$ whose edges are parallel to an edge of the common quartz pyramid.

2. *On a Crystal of Stephanite from Mexico* of very unusual appearance and distinguished by the large development of the new pyramid $\frac{1}{6}^{1}\breve{P}\frac{1}{3}^{1}\ \{11\ 3\ 6\}$.

3. *On Tridymite from Krakatoa.* The Tridymite occurs in the lava of Long Island, and is found in measurable crystals, a very rare mode of occurrence. It is mostly in simple hexagonal tables, but partly also in the usual twinned groups. One of these was found to be twinned by two distinct laws, the outer pairs of four consecutive leaflets consisting each of two crystals twinned on a face $\frac{1}{6}\ P\ \{855\}$ (referred to the hexagonal system), while the two outer leaflets are twinned on a face of $\frac{3}{4}\ P\ \}10\ 1\ 1\}$. This has also been found to be the case with crystals from Pachuca; and in fact the Tridymite from Krakatoa closely resembles in every respect that from other localities.

4. *On Colemanite from California*, by Dr. C. Bodewig and G. vom Rath. Colemanite is a calcium borate from Death Valley, Inyo Co., which has the formula $Ca_2\ B_6\ O_{11} + 5\ H_2\ O$, and is therefore very near to Pandermite or Priccite ($Ca_2\ B_6\ O_{11} + 3\ H_2\ O$) in composition.

The crystals resemble datholite in appearance. Hardness between that of fluor and apatite. Sp. gr. = 2·417.

System oblique—a : b : c = 0·7769 : 1 : 0·5416.

$\beta = 69°48\frac{1}{2}'$.

Cleavage parallel to the plane of symmetry. Fourteen forms were observed in combination.

Plane of the optic axes for sodium light perpendicular to the plane of symmetry, and inclined at an angle of 82°42′ to the vertical axis *c* in the obtuse angle between the axes *a c*. True axial angle = 55°20′, mean index of refraction = 1·590.

These results are confirmed by the observations of Professors Hiortdahl and Wendell Jackson, who have at the same time and independently studied the new mineral.

It may be added that the first of the above four papers contains some interesting notes upon the fine private collection of Mr. C. Bement, in Philadelphia.

H. Baron v. Foullon (*Jahrb. d. k. k. geol. Reichsanstalt*, 1884, p. 367) has examined the crystalline form of Tin. This was found by Miller to be tetragonal, but a rhombic variety has also been described by Trechmann (in vol. iii. of this Magazine). The crystals of Tin carefully described in the Paper were obtained from the molten metal, and agree in form with those described by Miller; the latter were obtained by galvanic deposition; it seems, therefore, that the tetragonal crystals may be obtained both by reduction from solutions and also by direct crystallisation from the molten metal. They are generally twinned, with frequent repetition on the face *P* (111).

It is concluded finally that the following are the modifications in which Tin is known to occur:—

(1) Grey Tin, Sp. gr. 5·781 — 5·809.
(2) Rhombic Tin, Sp. gr. 6·52 — 6·56.
(3) Tetragonal Tin, Sp. gr. 7·196 (perhaps higher).
(4) Previously Molten Tin (doubtful), Sp. gr. 7·2795.

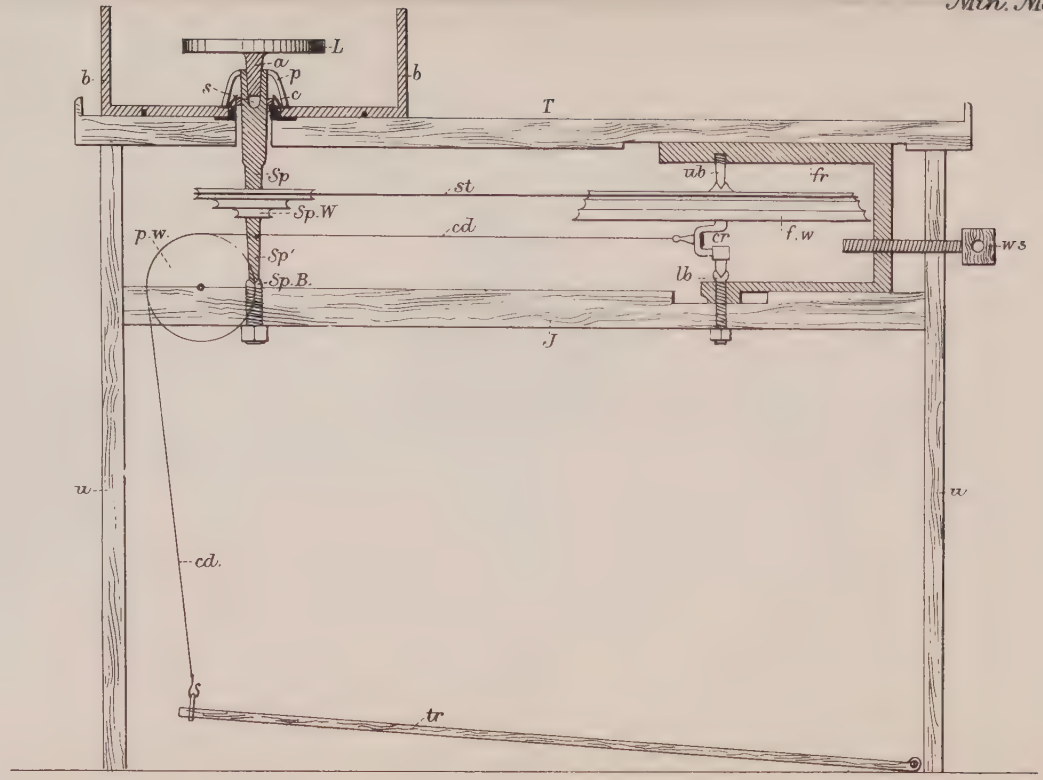
The last has been distinguished as a variety by Rammelsberg.

H. A. M.

O. Mügge, in the first number of the new *Jahrbuch der Hamburgischen wissenschaftlichen Anstalten* (*Hamburg*, 1884, p. 67), from a microscopical examination of sections of Cryolite with polarised light, concludes

that this mineral (which is actually oblique, though geometrically very near to the Rhombic or even the Cubic System) is twinned not only upon the planes OP (001), $\infty\breve{P}\infty$ (100), ∞P (110), as stated by Websky and Dana, but also, according to a fourth twin law, with the twin-plane $\pm \frac{1}{2} P$ $(112, 11\bar{2})$.

The conclusion is derived from a study of the lamellæ, striations, and lines of extinction on sections of Greenland Cryolite cut parallel to the cleavage planes. The author also finds that fragments which show no indication of the newly-described twin structure may have it permanently developed after they have been raised to the melting temperature of Zinc (423° C), and he suggests that this may account for the fact that the upper layers of the mineral, which have been exposed to the heat of lava flows, are cloudy, while the lower layers are generally clear. H. A. M.



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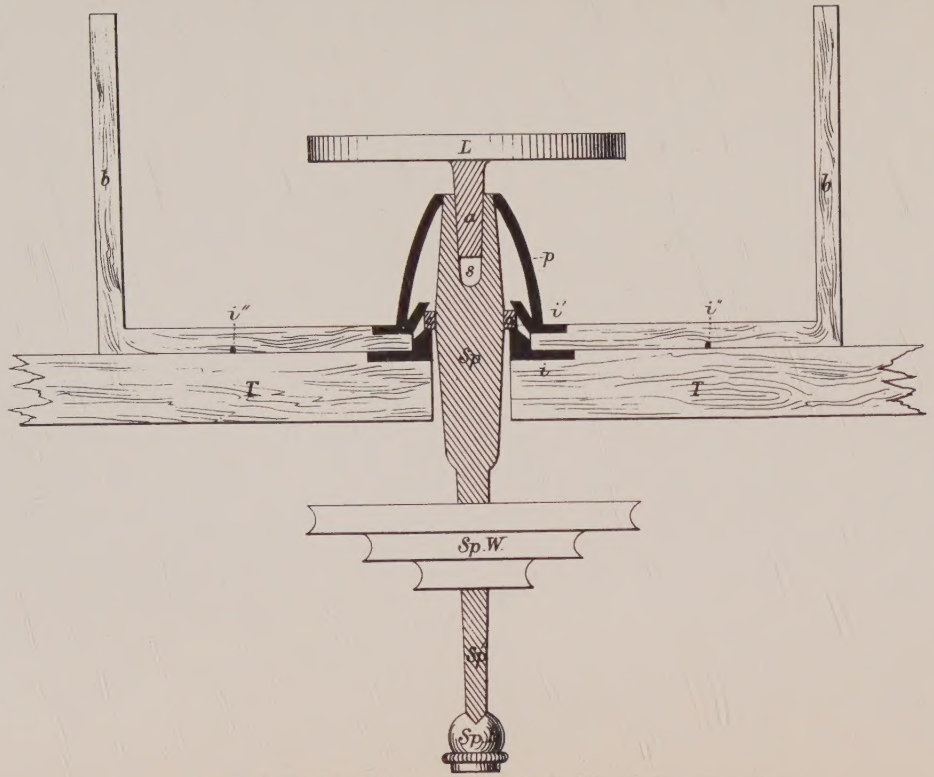
Diagrammatic section & drawing of Lapidary's Lathe.



Enlarged diagram of Grinding Apparatus.

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